Symptoms. Patient entered the Sanatorium in August, 1907, five years ago, in advanced condition, with high fever and expectoration. Had fever almost every day for two years. Since then the constitutional condition has improved remarkably, and for the past three years she has been, for most of the time, free of fever. Gain of weight of 17 kg. (37 pounds). Expectoration always high, about 120 grams during month previous to injection. Exercising about one-half hour, twice a day.

Physical Signs. Effusion on the right side at time of admission in 1907. Signs at time of injection indicated extensive fibroid infiltration throughout right lung, with destructive changes in upper lobe and thickened pleura and possibly some effusion below. Areas of infiltration and compensatory hypertrophy in left lung. Considered a rather unfavorable case before injection on account of probable pleural adhesions.

July 18, 1912. Attempt made at injection, but needle evidently entered thick pleural adhesions. No negative pressure or oscillations of manometer obtained. No gas injected.

Summary. Inoperable case on account of thickened adherent pleura.

General Summary. In 16 cases in which the treatment has been tried 2 have shown marked and apparently permanent improvement, 6 have shown temporary or slight improvement, in 1 case hemorrhages have apparently been controlled, in 1 case of lung abscess no improvement followed, while in 6 cases, on account of pleural adhesions, either no gas could be injected or not enough to produce any sufficient collapse.

THE DIAGNOSIS OF TUBERCULOSIS OF THE KIDNEY.[1]

By Floyd E. Keene, M.D.,

INSTRUCTOR IN GYNECOLOGY, UNIVERSITY OF PENNSYLVANIA; ASSISTANT GYNECOLOGIST TO THE UNIVERSITY HOSPITAL; GYNECOLOGIST TO THE CHESTNUT HILL HOSPITAL, PHILADELPHIA,

AND

John L. Laird, M.D.,

ASSISTANT INSTRUCTOR IN GENITO-URINARY SURGERY, UNIVERSITY OF PENNSYLVANIA; ASSISTANT SURGEON IN GENITO-URINARY DISEASES TO THE UNIVERSITY HOSPITAL; ASSOCIATE IN SEROLOGY, WILLIAM PEPPER CLINICAL LABORATORY, PHILADELPHIA.

It is only within comparatively recent years that tuberculosis of the kidney has become recognized as a distinct pathological entity amenable to treatment offering excellent chances for cure. While formerly looked upon as merely a terminal manifestation of a general tuberculous infection or as a rare disease difficult to diagnosticate, modern methods of examination, together with an accurate knowledge of its mode of infection, pathology, and clinical course, have proved quite the reverse to be true.

---

[1] Presented before the Philadelphia Pathological Society, December 12, 1912.

Without going into a discussion of the possible avenues of invasion, we can say that it is now a generally accepted fact that the tubercle bacilli reach the kidney by way of the blood stream, and that this infection is primarily unilateral in the great majority of cases. Probably because of the intimate vascular connection a specific infection of the opposite kidney originates more frequently from its sister organ than from any other focus in the body. The course of the disease is progressive, passing from bad to worse, and, according to Israel, there is no authentic case on record which has been cured by other than surgical measures.

While primary tuberculous cystitis must be considered a pathological rarity, the bladder is commonly the seat of disease secondary to a renal infection. In the presence of a tuberculous cystitis, with its changes promoting incomplete evacuation as well as stenosis of the orifice of the sound ureter, an ascending infection of the second kidney, with the ureter as the avenue of entry, is likely to follow, as the experimental work of both Albarran and Baumgarten has demonstrated. Starting as a single or multiple focus of infection the further progress of the disease may produce changes altering not only the pathological but the clinical picture as well. Excluding miliary tuberculosis, which is merely the local manifestation of a general miliary tuberculosis, four types may be differentiated. Following an eruption of tubercles scattered more or less diffusely throughout the kidney, there may be little or no tendency to caseation, but rather to connective-tissue proliferation, transforming the kidney into a dense, irregular mass, at times impossible to differentiate from a neoplasm. Should areas of softening be present they frequently are surrounded by firm fibrous tissue impregnated with lime salts. The fibrous as well as the fatty capsule participates in this general tissue proliferation. A second type much rarer than the others is characterized by ulceration of the renal papillæ, so-called tuberculous papillitis which was first described by Israel, and due, in his opinion, to the passage of the bacilli through the tubules of the kidney, lodging at the papillæ, where they exert their destructive action. The type most commonly encountered is that presenting one or more cavities at the junction of the cortex and medulla, and not infrequently located at one or the other poles. These cavities vary in size, and may or may not communicate with the pelvis of the kidney. There is generally a chronic interstitial nephritis affecting the remainder of the renal parenchyma. In all these types, especially during the earlier stages of development, the kidney may present no gross enlargement; on the contrary, when extensive interstitial changes with fibrosis are present the kidney may be smaller than normal. It is important to remember that the enlarged kidney may be the healthy one, the increase being due to compensatory hypertrophy incident to the added work which it must assume when the function of the opposite side is seriously impaired. The terminal stage of these various forms is seen in the tuberculous pyonephrosis, with almost or quite complete destruction of the renal parenchyma; a mixed infection may be engrafted on the tuberculous, transforming the kidney into an enormous pus sac. The ureter and bladder likewise participate in the tuberculous process, the infection being secondary to the primary renal focus, and of urogenic origin in most instances. Primary tuberculosis of the bladder is so rarely seen that its demonstration in the female sex means almost invariably that we have to deal with a primary focus in one or both kidneys. Changes in the ureter may be entirely absent, but, as a rule, some evidences of the tuberculous infection are to be found. These may consist merely of discrete tubercles scattered here and there along the mucous membrane, or, in cases of longer standing, there may be extensive thickening of the ureteral walls, with ulceration, connective-tissue proliferation, and contraction, forming one or more strictures which may completely occlude the ureter, resulting in the closed pyonephrosis. While this is but a cursory review of the pathology of tuberculosis of the kidney it represents the chief manifestations found clinically.

In spite of an enormous amount of literature and discussion on this subject, the diagnosis of renal tuberculosis is seldom made or even suspected by the general practitioner. The obsolete term irritable or nervous bladder remains a favorite expression of ignorance, dividing honors equally with false conceptions concerning the importance of uterine deviations in regard to the production of vesical irritability. An uncomplicated retroflexion seldom if ever produces urinary symptoms, and in the light of our present knowledge, acquired largely through the extensive use of the cystoscope, the term nervous bladder should be stricken from medical nomenclature. As a safe working rule, proven only by the rare exception, every bladder presenting symptoms should be considered the site of some organic lesion, and no effort should be spared to determine the exact nature of this lesion. We do not mean to imply that every irritable bladder is the seat of tuberculosis, but we do claim that only by following this rule can we hope to make the diagnosis sufficiently early to permit the application of proper surgical treatment.

We have reviewed the histories of twenty-five cases of tuberculosis of the kidney which have been admitted to Dr. Clark's service in the University Hospital, and the symptomatology which we shall give represents largely the summary of these cases.

In studying these histories, one is immediately impressed by the rarity with which the symptoms are directly referable to the kidney itself; even in cases of enormous pyonephrosis or complete occlusion of the ureter the most the patient may experience is a dull, indefinite aching sensation in the lumbar region, and even this may be entirely absent. On the other hand, the pain may be so severe as to warrant the diagnosis of calculus; these acute attacks of colic may be due to sudden obstruction of the ureter by a thick plug of pus or may be associated with an extensive perinephritis, and especially periureteritis, upon which is engrafted an acute congestion following exposure to cold or at the time of the menstrual period. This pain is doubtless due to two factors, namely, increased tension upon the thickened, inelastic capsule of the kidney and partial or complete occlusion of the ureter incident to the swelling induced by increased vascularity.

The first and by far the most prominent symptoms of renal tuberculosis during the entire course of the disease are those referable to some abnormality in the function of the bladder. Starting, as a rule, with painless polyuria all degrees of dysuria are met, including the most intense strangury and even complete incontinence. Such vesical disturbances are not necessarily due to an organic lesion of the bladder itself; even in the earliest stages of renal involvement, with no extension of the process beyond the renal parenchyma, the vesical irritability may be intense. This is difficult to explain, but is supposed to be of reflex origin, due to the intimate nerve connections between the kidney, ureter, and bladder or to the irritating action of toxins eliminated in the urine. In our series of cases there were only two in whom some evidences of bladder involvement were not present, and in both there was increased frequency of urination but no dysuria. As a rule, by the time the patient presents herself for examination the bladder has become involved and the urinary disturbances are in more or less direct proportion to the degree of extension. These symptoms may be decidedly intermittent in their severity, with intervals of comparative comfort between the acute exacerbations. It is doubtless true that many cases reported as improved under tuberculin treatment are merely manifestations of the natural course of the disease.

In addition to these local symptoms are those commonly present in any chronic infection. While in the early stages the general health is but little if any affected, sooner or later indefinite gastrointestinal symptoms, especially nausea and vomiting, present themselves. There is a progressive loss in weight, and the patient tires easily on slight exertion. Contrary to the opinion so commonly expressed the temperature is normal, or at most shows only a slight evening elevation. Irregular fever, with chills and sweats, are evidences of a mixed infection or a more generally disseminated tuberculous process.

With the exception of the earliest cases, limited to a small abscess in the renal cortex, some degree of pyuria is the rule. The quantity of pus will naturally vary with the extent of involvement of the urinary tract; the greater the bladder involvement the greater the pyuria. In the presence of a mixed infection the urine is often loaded with pus, while in even advanced cases of pure tuberculous infection the pus is found in comparatively small amounts, may be entirely absent, or may be abundant at one examination, with only a moderate amount at the next. These variations are easily explained when we refer to the pathology. In the early cases there is no connection whatever between the tuberculous focus and the pelvis of the kidney. Or in the more advanced case, where are we dealing with a closed pyonephrosis, there is no communication with the bladder, and the pus cannot escape. The rapid change in the quantity of pus is more or less characteristic of renal tuberculosis, and is due either to the rupture of a cortical abscess into the pelvis of the kidney or to some factor promoting better drainage of an abscess which already communicates with the pelvis. While the discussion of the bacterial content of the urine is not in our province, we may be permitted to state the general working rule that pyuria without demonstrable bacteria, either by smear or culture, strongly suggests the possibility of a tubercular infection. Macroscopic hematuria is rarely seen even in the advanced stages of renal tuberculosis, and when present is usually of vesical rather than renal origin. In one form of the disease—namely, the tuberculous papillitis—profuse hematuria is characteristic. Albuminuria is usually present, but small in amount compared to the degree of renal involvement.

The objective findings must of necessity depend upon the type of disease as well as upon the degree to which the infection has extended to the bladder and ureter. In the early cases, in which the disease is limited to the renal cortex, physical examination will show no abnormalities whatever; usually, however, an enlargement of the kidney is manifest. Under normal conditions the right kidney can be palpated in 75 per cent. of women, consequently disease on this side is more easily demonstrated than when the left kidney is involved. Even a considerable enlargement on the left side may escape detection; this is especially true in those cases in which perinephritic thickening anchors the kidney in its high position. While the kidney may be diminished in size in the sclerotic type of the disease, this is rarely demonstrable clinically; the kidney either escapes detection entirely or a fixed mass can be palpated, consisting not only of kidney but its infiltrated fatty capsule. It must be remembered that a demonstrable enlargement does not necessarily indicate the diseased side, since this increase in size may be due to compensatory hypertrophy of the sound kidney. Tenderness, especially at the costovertebral angle, is rarely absent, and is directly proportionate to the extent of perinephritis. When the disease has extended down the ureter there may be tenderness along its course, but even in those cases with marked thickening and complete stenosis we have never been able to say definitely that the ureter could be palpated by abdominal examination. Thickening of the vaginal portion of the ureter can be readily palpated, and its demonstration may be of importance in determining the side affected. While many authors lay great stress upon this point, and some even go so far as to state that it is pathognomonic of tuberculosis, too great dependence upon its significance will lead one astray, for we have been able to demonstrate ureteral thickening in several cases of pyelocystitis in which tuberculosis could be absolutely ruled out. Its presence is suggestive, but by no means characteristic.

The tuberculin reaction is of doubtful value; we have employed only the subcutaneous injection, and its results were considered significant only in the presence of increased kidney or bladder symptoms.

Lastly and by far the most important factor in the diagnosis is the cystoscope. It is often the only means at our command to determine the nature of the infection, and only by its use can we estimate the extent of involvement of the urinary tract, which is of the most vital importance in its bearing upon the advisability of surgical intervention. In women the diagnosis of vesical tuberculosis means almost invariably that the primary focus is in one or both kidneys; while in the majority of cases the changes in the bladder are characteristic, we occasionally meet instances of renal involvement, with a normal bladder picture, or, on the contrary, there may be such extensive disease of the bladder that the typical lesions of tuberculosis are masked. In the former the cystoscope is still a valuable aid in that it determines definitely the source of the pyuria; further, in the presence of vesical symptoms, with insufficient evidence in the bladder or its surrounding organs to account for these symptoms, tuberculosis of the kidney is a strong possiblity. While simple cystoscopy may not suffice in the far-advanced changes to warrant a diagnosis of tuberculosis, it at least shows that we are dealing with a severe infection which demands more detailed examinations to determine its exact nature. These include microscopic and bacteriological studies of the urine, ureteral catheterzation, and one or more of the functional kidney tests. In referring to the pathological changes in the bladder we follow the classification of Caspar, designating them as tuberculosis of the bladder and tuberculous cystitis; the former is a distinctly localized process, the latter general, involving not only the mucosa but often the muscularis as well. At the beginning of the disease the bladder as a whole shows little or no change from the normal; the characteristic picture is presented at the ureteral orifice and the mucosa surrounding it. Due to ureteral thickening the orifice is no longer linear but round, with edema, reddening, and superficial, irregular ulceration of its edges and adjacent mucosa. Further ulceration transforms the ureteral ostium into a large, crater-like opening, with rigid, unyielding walls covered with indolent granulation tissue. Contraction of the scar tissue of the ureter produces not only marked irregularity of the orifice, but actual retraction of the entire ureteral region, so that this portion of the bladder assumes a funnel-shape, with the larger opening directed downward. The orifice may also be surrounded by the so-called edema bullosum, or the picture may closely resemble a neoplasm when papillary alterations are present. Miliary tubercles are likewise found, usually situated in the trigone, but may be located in the fundus or sides of the bladder. In our series of cases tubercles were found only twice, which leads us to the conclusion that they are rather unusual manifestations. With further extension of the disease or in the presence of a mixed infection, which is so often present in the advanced cases, a more or less general cystitis ensues, with irregular ulcers and ecchymoses scattered here and there over the universally inflamed mucosa. Because of its long duration the infection involves not only the mucosa but extends into the musculature, thereby diminishing the size of the bladder until its capacity may be reduced to a few centimeters. Under these circumstances the ureteral orifices may be completely obscured and the typical pathology so masked that a diagnosis of tuberculosis is possible only by animal inoculation.

Having determined the nature of the infection, it is of equal importance to ascertain whether one or both kidneys are involved. In our opinion this can be accomplished only by catheterization of the supposedly sound side with a careful chemical, microscopic, and bacteriological study of the collected urine; a normal ureteral orifice does not prove that the corresponding kidney is not diseased, since the infection may not have extended beyond its original renal focus, nor is a normal functional test sufficient because the disease may not involve enough of the renal parenchyma to seriously interfere with its working capacity. Theoretically, catheterization of the sound ureter is objectionable because of the danger of promoting an ascending infection from an already diseased bladder; practically, however, this objection does not hold when care is exercised in passing the catheter directly into the ureter without touching the mucosa of the bladder and inserting the catheter only a few centimeters rather than into the pelvis of the kidney. The diagnosis is not complete until we have demonstrated not only anatomical but also functional integrity of the opposite kidney; the fact that the patient is free from the symptoms of renal insufficiency is certainly of the greatest value, but this must be further substantiated by the employment of one or more of the functional tests. For this purpose we prefer indigocarmine, not only because of its simplicity and adaptability in even the most extensive forms of bladder infection, but also, and what is even more important, it affords a reliable index of the relative functional capacity of the sound kidney.

When these various examinations have failed to reveal the site of disease, the skiagraph may offer valuable information, as was our experience in one case which baffled the diagnosis by every other means. The cortical abscesses may cast a shadow when a deposit of lime salts is also present, but this is unusual, and therefore of but little practical importance. By means of ureteral catheterization and the injection of collargol the skiagraph may reveal not only strictures of the ureter, but also one or more cortical abscesses in communication with the pelvis of the kidney. In the one case referred to the small abscess was clearly shown and proved at operation.

This *resume* includes the more important clinical factors concerned in the diagnosis of tuberculosis of the kidney. While in many cases the diagnosis is plainly evident from the clinical findings, in others the nature of the infection is obscure and can be recognized only with the assistance of the laboratory. This phase of the subject will be covered by Dr. Laird.

The diagnosis of renal tuberculosis in the female is practically determined by positive tuberculous findings in guinea-pigs inoculated with the urinary sediment. In the male, however, the close relationship between the urinary and genital tracts renders the differentiation of the two, as the possible source of infection, necessary, and this lies principally in the clinical field. If by the clinical methods already described the kidneys have been proven normal, a thorough examination of the genital tract should be made to determine a possible involvement of the epididymides, vasa deferentia, seminal vesicles, prostate, or testes. As the kidneys are usually the primary foci of infection in the urinary tract, so the epididymides are the primary source of tuberculous infection in the genital tract. Primary tuberculous prostatitis, seminal vesiculitis, and orchitis have been reported, but these conditions were probably due to an indeterminate focus in the epididymis. As such foci may be clinically indeterminable, the secondary involvement of the other genital organs is naturally of importance in the diagnosis. The physical examination may reveal an enlarged, non-tender, non-painful, hard, nodular epididymis; thickening and induration of the vas deferens; a slightly nodular, non-tender, markedly indurated, and fixed prostate or seminal vesicle. The symptoms of tuberculosis of the genital tract are referable to disturbance of the genital function—namely, sexual erethism, discomfort or pain on ejaculation (which may, in acute cases, be slightly bloody), general weakness and nervousness after intercourse, leading finally to neurasthenia, usually sterility and later impotence. Pus may be absent from the urine in incipient cases of tuberculous epididymitis, but is usually present in cases with secondary involvement. The chronicity of the process is an important diagnostic point. The final diagnosis depends upon the finding of the tubercle bacilli in the seminal fluid or prostatic secretion.

Laboratory Method.—Until the last few years the laboratory diagnosis of renal tuberculosis has depended upon the intraperitoneal or subcutaneous method of inoculation of rabbits or guinea-pigs. These methods consume about six weeks time or the time required for general tuberculosis to develop in the inoculated animals. To save this valuable time, Bloch, in 1907, advocated the inguinal method of inoculation, which requires only ten days for a positive diagnosis. Much has already been written upon this subject, but the advantage of the Bloch method as a time-saver over the old method, and the fact that the older, slower method is still quite generally used, especially in this country, were thought sufficient reasons for touching upon it once more in this comparative study.

The technique is as follows: A twenty-four hour specimen of urine is collected from the suspected case in a large sterile bottle, without the addition of a preservative. About 10 c.c. of urine from the lower portion of the specimen are placed into each of two centrifuge tubes and centrifugalized for from two to four hours, dependent upon the speed of the centrifuge, when the supernatant urine may be poured off, leaving the sediment in the bottom of the tubes.

From the sediment in one of the tubes, slide smears are made, which are then fixed, stained and examined microscopically for pus, blood, and bacteria, especially acid-fast bacilli. (Gabbett's method of staining the tubercle bacilli was employed in this work.) Pus is nearly always present in the urine in renal tuberculosis, varying greatly in amount, not only in the various stages of the disease, but also from time to time even in the late stages. This pus has, moreover, often a characteristic appearance both macroscopically and microscopically. The pus in tuberculous urine is grayish and granular, giving the urine when held to the light a ground-glass appearance in contrast to the soft yellowish appearance given by the pus in other conditions. The presence of blood, although occasional in renal tuberculosis, is more indicative of other pathological conditions of the genito-urinary tract. Acid-fast bacilli are nearly always present in the sediment in renal tuberculosis, but are frequently seen in the non-tuberculous conditions. The differentiation of the tubercle bacillus from the other acid-fast organisms, in spite of unceasing efforts at differential staining, is microscopically impossible. Although here as macroscopically the appearance of the pus and the bacilli is sufficiently characteristic to arouse a suspicion which will afterward be proven a surety in a large percentage of cases. In contrast to the more or less discrete leukocytes comprising the pus seen in non-tuberculous genito-urinary affections, there are present large clumps of degenerated leukocytes, about the periphery of which will be found the typical slender, slightly curved, beaded rods, arranged in semiparallel groups, and giving one the impression that these organisms had a distinct part in bringing about the degeneration, whereas the other acid-fast organisms appear to have been accidentally dropped into a field of pus cells. The final diagnosis, therefore, must always depend upon animal inoculation.

For this purpose a suspension of the sediment in the second tube is prepared by shaking with 5 c.c. of sterile water. Two healthy, normal guinea-pigs are inoculated. The inguinal glands of the pigs are first slightly injured and thus rendered more susceptible to the attack of the tubercle bacillus, by pressing and rolling them between the forefinger and thumb for a few moments prior to the inoculation. 2½ c.c. of the prepared suspension, unheated, are then injected into each of the two pigs, subcutaneously, in the inguinal region directly below the glands. Pressure is again applied for a short time and repeated on the two days following the injection.

Ten days after the inoculation one of the two pigs is chloroformed and the inguinal glands on the injected side removed. These may be either sectioned, stained, and examined for tubercle bacilli, or, more simply and quite as reliably, finely macerated and pressed out between two microscopic slides, and fixed, stained and examined immediately.

In the majority of positive cases the microscopic examination of the inguinal glands results in the discovery of the tubercle bacilli in a few minutes. In some cases, however, in which the tubercle bacilli have been probably few in number or of low virulence the resultant inguinal involvement is so slight that the bacilli may escape detection by a cursory examination, and therefore a thorough search of every portion of the inguinal tissue should be made before a negative diagnosis is given.

In order to control the Bloch method of inoculation the second pig was allowed to live the required six weeks and then examined for general tuberculosis.

STATISTIC TABLE.

	Positive.	Negative.	Doubtful.
Clinical diagnosis	22	29	7
Bloch method	17	40	1
Subcutaneous method	17	40	1

Total, 58 cases. Positive by laboratory methods, 77.3 per cent.

There were 58 cases of suspected renal tuberculosis examined by the combined clinical, Bloch, and subcutaneous laboratory methods. Twenty-two cases were proven, 7 by operation and 15 by subsequent clinical course, to have tuberculosis of the genito-urinary tract; 29 were proven, 3 by operation and 26 by subsequent clinical course, to be non-tuberculous; 7 cases were still clinically doubtful. By the Bloch method of inoculation, 17 cases were positive, 40 negative, and 1 doubtful, due to the premature death of the pig. By the subcutaneous method 17 were positive, 40 negative, and 1 doubtful, due to the same cause. In the clinically proven cases of tuberculosis, therefore, 77.3 per cent were positive by both laboratory methods. The 7 clinically doubful cases gave negative results by both methods. Of the clinically proven negative cases all but 1 gave negative results, and this was positive by both the Bloch and subcutaneous methods. This case was brought to operation on account of the positive laboratory findings; the apparently affected kidney was exposed and split, and showed, macroscopically, an interstitial nephritis and no evidence of tuberculous involvement. Two of the proven positive cases which gave negative laboratory results were closed cases, the ureter of the affected side being obstructed: 1 had advanced bilateral renal involvement, which shortly caused death; the other 2 were frank cases of unilateral renal tuberculosis. There were 2 clinically positive cases, each giving negative results by each of the two laboratory methods and positive by the other. Another positive case showed numerous tubercle bacilli in the inguinal glands of the pig at the expiration of ten days, and only one small focus of infection in the spleen of the other pig at the end of six weeks.

Note.—The Oppenheim method of hepatic inoculation was tried in a few instances resulting in every instance in the premature death of the pigs from septicemia.

Conculsions.—1. The kidney is the primary site of disease in tuberculosis of the female urinary tract; as a rule the infection originates from a focus in some other organ and gains entrance to the kidney by way of the blood stream.

2. The pathology varies greatly in kind as well as in degree, but a definite type usually predominates, altering both the pathological and clinical pictures.

3. Subjective symptoms referable to the kidney disease are by no means characteristic; they are often entirely lacking, may be expressed by a dull, aching sensation in the lumbar region or by attacks of colic resembling calculus.

4. The most prominent symptoms are those referable to deranged bladder function; starting with painless polyuria, all degrees of dysuria are met, including the most intense strangury and even incontinence. These symptoms may be decidedly intermittent in their severity, with intervals of comparative comfort. A cystitis which does not readily yield to the usual appropriate measures should arouse the suspicion of renal tuberculosis.

5. Some degree of pyuria is the rule; hematuria the exception. Intermittent pyuria suggests tuberculosis of the kidney. Pyuria without demonstrable bacteria by smear or culture in a catheterized specimen is likewise suggestive. Albuminuria is usually present, but small in amount compared to the degree of renal involvement

6. In the absence of mixed infection the temperature is normal or shows only a slight evening elevation; irregular fever with chills and sweats is evidence of a mixed infection or a more generally disseminated tuberculous process.

7. The palpatory findings are dependent upon the type and extent of the pathological changes. While enlargement of the diseased kidney is usually manifest, it is important to remember that compensatory hypertrophy of the kidney may be given erroneous conclusions in determining the diseased organ. Thickening of the vaginal portion of the ureter is of value in diagnosis, but by no means characteristic of tuberculous infection.

8. The tuberculin reaction is of doubtful value; the subcutaneous injection should be employed and its results are significant only in the presence of increased kidney or bladder symptoms.

9. By far the most important agent in determining the diagnosis is the cystoscope, which in the majority of cases shows a picture so characteristic that the nature of the infection is at once recognized. Only by its use can we decide the extent of disease as well as the condition of the opposite kidney as regards both its anatomical and functional integrity.

10. The diagnosis of renal tuberculosis should be made in every suspected case by the combined clinical and laboratory examination.

11. The Bloch method of inoculation of guinea-pigs should be used, because it is equal in reliability to the older method, and the diagnosis may be made in at least 77.3 per cent. of cases in ten days compared to six weeks by the subcutaneous or intraperitoneal methods, which should also be used as controls.

12. A positive laboratory result by either method determines the diagnosis of tuberculosis of the genito-urinary tract; of renal tuberculosis in the female, the exact focus in the male to be determined by additional clinical and laboratory means.

13. A single negative laboratory result, regardless of thoroughness of examination, does not determine an absolute negative diagnosis of renal tuberculosis, as the manifestation of this disease is essentially intermittent. Negative results obtained in three successive weekly examinations should, however, bear considerable weight in the diagnosis.